



United States Department of Agriculture

HUNGRY PESTS INVADE MIDDLE SCHOOL



A National
Standards-Based
Curriculum
for Grades 6–8





DEAR TEACHER,

Welcome to ***Hungry Pests Invade Middle School***—an exciting educational journey into the world of invasive species. Our parks, forests, and crops and the U.S. Department of Agriculture (USDA) need your help. Hungry pests eliminate jobs, threaten our food supply, destroy our natural resources, and cost the United States billions of dollars. How do they spread and cause so much harm? Too often, it's the everyday actions of people everywhere, who don't realize they are helping to spread these invasive pests and diseases.

As an educator, you can help stop the spread of hungry pests by incorporating ***Hungry Pests Invade Middle School*** into your classroom. This standards-based curriculum for grades 6–8 is designed to engage your students and raise their awareness about invasive species through informative, discovery-based activities. Each lesson features at-home connections, additional extension activities, and links to cross-curricular subjects.

In learning how invasive species move around, kids can share this knowledge with family and friends—and be leaders in helping to stop the threats. And by using these lessons with your students, you will play a major role in helping to **Leave Hungry Pests Behind**.

Sincerely,

Scott Pfister
Director, Pest Management
Animal and Plant Health Inspection Service
USDA

And **Your Partners at USDA**

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- Analyze the various ways that invasive species are a threat

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GETTING STARTED

Hungry Pests Invade Middle School is designed for easy implementation in middle school classrooms.

Engaging Lessons

Each lesson includes an overview, subject connections, suggestions for timing, a list of supplies, preparation steps, learning objectives, and essential questions to guide student inquiry. Throughout the lessons, you'll see suggested teacher tips to aid in instruction, at-home connections to engage family and friends, and extension activities to deepen student exploration and learning during class or to assign as homework.

Standards-Based

The curriculum is aligned to national education standards (The Next Generation Science Standards, The Common Core State Standards for English Language Arts and Literacy and The Standards for Mathematical Practice, and National Curriculum Standards for Social Studies) as well as individual State standards for Florida, Pennsylvania, and Texas. A standards chart is located at www.HungryPests.com/resources/educators.php.

Cross-Curricular

While lessons might be a natural fit in your science or ELA classroom, learning activities cover various topics that connect to several core subjects, such as geography, math, government, and economics.

Project-Based

Activities are student centered and inquiry led. Each lesson deepens student knowledge of invasive species through close reading of relevant texts, team research projects, interactive mapping activities, and class reflection. In Lesson 4, students get to demonstrate their understanding through a capstone project that challenges them to engage an outside audience and spread the word about hungry pests.

Resources

The Hungry Pests Web site (www.HungryPests.com) is a valuable tool for both teachers and students, featuring:

- **Partner Tools**—Download Hungry Pests public service announcements, outreach materials, and customizable tools. (www.HungryPests.com/partner-tools)
- **Educator Tools**—Access and download additional curriculum materials and activities. (www.HungryPests.com/resources/educators.php)
- **Youth Page**—Access activities, games, and videos for kids to use. (www.HungryPests.com/resources/youth.php)
- **Interactive Infographic: Hungry Pests and You**—An interactive game that exposes students to the impact invasive species have on their daily lives through a visual and informative survey. (<http://www.hungrypests.com/resources/interactive.php>)
- **Maps**—Downloadable maps showing the spread of specific invasive pests across the United States.

TEACHER NOTE

Lesson 1 is the first step in project-based learning, a teaching method in which students create solutions for real-world problems. All activities build knowledge of, and familiarity with, invasive species. They also prepare students to take ownership in the creation of community campaigns in Lesson 4 to help stop the spread of hungry pests.

Check out the interactive infographic to find out how hungry pests can impact your students' daily lives!



Tip! **HUNGRY PESTS** 101 If hungry pests are new to you, visit www.HungryPests.com/faqs for answers to frequently asked questions about invasive species.



LESSON 1

ATTACK OF THE INVASIVE SPECIES!

GRADE 6–8

Lesson Overview:

Invasive species are a serious threat to our country and have the potential to devastate our crops and trees. This lesson will introduce to students the concept of invasive species. Students will begin to explore the damage and threat these pests cause and, most importantly, discover how invasive species can, or already do, impact their own lives and communities. Making the issue of invasive species relevant to students' daily lives expands awareness and provides personal and group motivation for more research, learning, and action—all of which will take place in Lessons 2, 3, and 4.

Topic:

Learning about invasive species: what they are, the threats they pose, and damages they can cause

Subject Connections:

Science, English Language Arts, Social Studies

Suggested Timing:

Four 45-minute class periods

- **First Class**—Pest Background Knowledge; Vin-troduction; Attack of the Invasive Species!
- **Second Class**—Invasive Species Executive Order
- **Third Class**—A Day in Your Life With Invasive Species; Why Should I Care?
- **Fourth Class**—Exploring the Threat

Note: Extra class periods can be added to accommodate more time for research during the *Exploring the Threat* activity.

Supplies:

- Access to computer lab, computers, and Internet connection
- Chart paper
- Markers
- Teacher Handouts:
 1. *A Letter From Vin*
 2. *Exploring the Threat*
- Student Handouts:
 1. *Attack of the Invasive Species!*
 2. *A Day In Your Life With Invasive Species*
 3. *Exploring the Threat*

Preparation:

- Copy and cut out one set of the *Exploring the Threat* cards.
- Make copies of the student handouts for each student.

- Download and print copies of APHIS' *Attack of the Invasive Species* factsheet at www.aphis.usda.gov/publications/plant_health/content/printable_version/fs_attack_of_the_invasive_species.pdf.
- Download and print copies of the **invasive species Executive order** (Executive Order 13112 of February 3, 1999) at <http://www.invasivespeciesinfo.gov/laws/execorder.shtml>.
- Access the public service announcement (PSA), "A Lot of Mouths to Feed" on the Hungry Pests Web site (www.HungryPests.com/press-room/psa.php) or print *A Letter From Vin*.
- Access **Hungry Pests and You**, the interactive infographic game (<http://www.hungrypests.com/resources/interactive.php>).

Learning Objectives:

Students will...

- Define invasive species during a group discussion.
- Understand the importance of (and our reliance on) U.S. agriculture and forests.
- Identify ways in which invasive species can harm agriculture and the environment and cause problems for people.
- Analyze the various ways that invasive species are a threat.

Essential Questions:

What are invasive species?

What kind of threat do invasive species pose?

What kind of damage can invasive species cause?

How do invasive species affect me and my State, community, and family?

Why are U.S. agriculture and forests important? How do I rely on them?

Introduction

1. Pest Background Knowledge

Introduce the concept of invasive species to students by having them draw upon existing knowledge about pests from real-world experience or previous units/lessons. Post the following questions on chart paper around the room:

- *What is a pest?*
- *What does invasive mean?*
- *What are species?*
- *What are invasive species?*

Ask students to move around the room and write a response for each prompt. After each student has visited each prompt, ask for a student representative to summarize the responses. Make sure students understand that invasive species can be plants, animals, or pathogens that are not native to an ecosystem and are likely to cause harm. In the following lessons, students will focus on invasive plant pests and diseases. Alert students to the fact that invasive pests might even be found in their own backyards!

DEFINING PESTS

According to The International Plant Protection Convention (IPPC) Glossary of Phytosanitary Terms, a pest is a species, strain, or biotype of plant, animal, or pathogenic agent injurious to plants or plant products.

Tip! **MAKE IT VISUAL!** Make students squirm in their seats by sharing images of hungry pests. Visit the invasive species slideshow for each pest on the Hungry Pests Threat page at www.HungryPests.com/the-threat. Just click the pests of interest and use the right and left arrows on the main image screen to scroll through the photos.

Share with students an example of a hungry pest to help them further understand the elements of an invasive species. For example, the **giant African snail** is an invasive pest that was first found in southern Florida in the 1960s. It took 10 years and \$1 million to eradicate it from the State, but the snail was reintroduced into Florida in 2011. The **giant African snail** is one of the most damaging snails in the world because it feeds on at least 500 types of plants and can cause structural damage to plaster and stucco structures. This snail can also carry a parasitic nematode that can lead to meningitis in people, making it a threat to human health. The **giant African snail** reproduces quickly, generating about 1,200 eggs in a single year.



GIANT AFRICAN SNAIL

Tip! **GIANT AFRICAN SNAIL PEST CARDS** Print copies of the **giant African snail** pest card (available at www.HungryPests.com/partner-tools/HP-PestCards-GAS.pdf) to share with students.

2. Vin-troduction

Introduce students to Vin Vasive, the spokesbug for hungry pests everywhere. Depending on access to technology, you can either read aloud **A Letter From Vin** (Teacher Handout 1), or play the 60-second PSA, “A Lot of Mouths to Feed,” on www.HungryPests.com/press-room to expose students to Vin’s menacing ways. Afterward, have students share their reactions to Vin Vasive and make predictions about the kinds of damage he might bring to agriculture and the environment, as well as the problems he might cause for people.



Exploration + Research

3. Attack of the Invasive Species!

To provide students with more information on invasive species, have students read APHIS' **Attack of the Invasive Species!** factsheet (www.aphis.usda.gov/publications/plant_health/content/printable_version/fs_attack_of_the_invasive_species.pdf).

Tip! **JIGSAW READING** Break up the **Attack of the Invasive Species!** factsheet by assigning small student groups to read each section. After groups have read their own sections, have them share what they learned with the rest of the class. Take it to the next level by having each group create a pest team name. (For example: "Pest Preventers," "Bug Busters," or "Team Invasive Species.")

After students have read the factsheet, they can complete the **Attack of the Invasive Species!** worksheet (Student Handout 1) with the following exploratory questions to help them summarize the informational text.

1. What are invasive species?
2. Do you think invasive species would make good pets?
3. What does APHIS stand for?
4. Why are invasive species threatening?
5. How do invasive species travel?
6. Who wrote the factsheet text? Why does the author care about invasive species?
7. How does APHIS protect the United States from invasive species?
8. What are some ways individuals can stop the spread of invasive species?

After students complete the worksheet, review each question and call on students to share their answers. Have them generate a list of any unanswered questions they still have about invasive species. Keep the list visible in the classroom for students to reference, and have them work to answer the questions as they learn more about invasive pests in future activities.

Tip! **DRAW IT!** After students have finished the **Attack of the Invasive Species!** worksheet, have them flip the page over and create a pictorial representation of the article.

4. Invasive Species Executive Order

To foster a deeper understanding of the term invasive species, have students read the **invasive species Executive order** (Executive Order 13112 of February 3, 1999).

Tip! **SOCIAL STUDIES CONNECTION** The **invasive species Executive order** shows how serious the Government is about invasive species. Use this opportunity to help students further understand how Executive orders are made and to discuss with students the Government's role in establishing order and security.

Before handing out the reading, ask students what they know about Executive orders. Explain that an Executive order is an official instruction by the president that tells Federal agencies to follow certain policies and procedures.



IMPORTANT ACRONYMS

USDA

The U.S. Department of Agriculture (USDA), also known as the Agriculture Department, is the Federal executive department in the United States that provides leadership on food, agriculture, natural resources, rural development, nutrition, and related issues.

Web site: www.usda.gov

APHIS

The Animal and Plant Health Inspection Service (APHIS) is an agency within USDA. APHIS' mission is to protect the health, welfare, and value of American agriculture and natural resources.

Web site:

www.aphis.usda.gov

Divide students into five different groups, one for each section of the Executive order text:

- **Section 1.** Definitions
- **Section 2.** Federal Agency Duties
- **Section 3.** Invasive Species Council
- **Section 4.** Duties of the Invasive Species Council
- **Section 5.** Invasive Species Management Plan

Make each group responsible for reading and becoming experts on their assigned section.

Tip! **NEW VOCABULARY** Remind students to highlight and define any new terms they encounter while reading. (New vocabulary may include: concurrence, conjunction, consultation, dissemination, eradication, non-indigenous, noxious, nuisance, practicable, propagating, prudent, restoration, suppressing, vested.) Have students add to a classroom word wall or vocabulary journal as they go.

Have groups prepare a short 60-second presentation to share their sections with the rest of the class. Give groups a sheet of chart paper to use for outlining important details and key facts from their sections. Encourage students to create visuals in order to explain complex concepts. After the presentations, hang the chart paper around the room for students to reference in upcoming activities.

Close the activity by asking students to reflect on the **invasive species Executive order** as a whole. Ask: *Why do you think former President Clinton issued an Executive order? How did the Executive order define invasive species? What council did the Executive order establish? Do you think the Executive order was helpful? Why or why not?*

Main Activity + Assessment

5. A Day in Your Life With Invasive Species

Have students read the USDA blog post, ***A Day in Your Life With Invasive Species*** (Student Handout 2). The article explains how invasive species can impact our daily lives, from the breakfast table to an afternoon baseball game.

Tip! **A DAY IN YOUR LIFE REFLECTIONS** Have students draft short paragraphs sharing one thing they learned that surprised them from the ***A Day in Your Life With Invasive Species*** blog post. Students can use the following prompt: "After reading the ***A Day in Your Life With Invasive Species*** blog post, I was surprised to learn that..."

After reading, have students complete the interactive infographic **Hungry Pests and You** (<http://www.hungrypests.com/resources/interactive.php>), a game that exposes students to the impact invasive species can have in their lives.

After completing the game, have students talk with a peer about the experience. Ask: *What items did you pick? Were you surprised by the results? What did you learn?*

Encourage students to share the game with family and friends via social media or email to help others learn more about hungry pests.

DID YOU KNOW

Share with students the following ways that invasive species attack their favorite foods, drinks, sports, and activities:

FOODS

- **Pancakes.** Asian longhorned beetle larvae eat maple trees from the inside out, affecting the production of maple syrup.
- **Macaroni and cheese.** The Khapra beetle threatens our grains, including noodles and other pasta.
- **Bananas.** The false codling moth is a threat to our fruits, including bananas.
- **Peanut butter and jelly.** The European grapevine moth feeds on the grapes used to make grape jelly.
- **Rice.** The Khapra beetle can infest stored rice.

DRINKS

- **Lemonade.** *Huanglongbing* (citrus greening) threatens our citrus.
- **Orange juice.** Mexican fruit fly maggots can ruin many of our fruits, including oranges.
- **Apple juice.** Mediterranean fruit fly maggots are also a threat to many fruits, such as apples.
- **Grape juice.** The European grapevine moth puts California grape and wine industry at risk.

SPORTS AND ACTIVITIES

- **Hiking.** Emerald ash borer, Asian longhorned beetle, gypsy moth, and sudden oak death could destroy trees along your favorite hiking trails.
- **Gardening.** The giant African snail munches on more than 500 different types of plants.
- **Camping.** Hungry pests could turn your summer campsite into a barren winter scene made up of dying or defoliated trees and bushes.
- **Biking.** Hungry pests could alter the tree-lined scenery of your favorite bike route.
- **Bird watching.** The habitat of your favorite birds could be on the menu of hungry pests.
- **Baseball.** Emerald ash borer has destroyed tens of millions of U.S. ash trees and could turn ash baseball bats into a luxury item.

6. Exploring the Threat

Now that students have gained more awareness of invasive species and discovered the impact these pests could have in their own lives, have them dig deeper to discover the various environmental, economic, and human health damages invasive pests can cause.

Have students draw an **Exploring the Threat** card (Teacher Handout 2) from a hat or box. (**Note:** There are 11 threat cards. Depending on class size, students can share cards and work in pairs or groups of three).

Each card contains a different threat and additional prompts (e.g., *Why is biodiversity important? What trees grow in my community?*) to help students reflect on the impact each threat could have in their community and their State.

PUSH OUT NATIVE SPECIES

What native species are in your community or State?

REDUCE BIOLOGICAL DIVERSITY

What is biological diversity?
Why is biodiversity important?

IMPACT GLOBAL TRADE

How can a change in imports or exports threaten our food security?

TERMS TO KNOW

Agriculture—the production of plants and animals useful to humans, involving soil cultivation and the breeding and management of crops and livestock

Biological diversity—the amount of genetic, species, or ecosystem variation within an area

Native species—plants or animals that exist in an area naturally, not by human introduction

Treatments—actions taken to prevent damage caused by invasive species:

- Application of insecticides on trees
- Soil fumigation to reduce the number of root-infesting pests and diseases
- Solarization (covering a field with plastic and letting the sun “cook” the soil pests)

Economic impact—the cost of invasive species on an area’s economy

Economic dependency—a country’s reliance on outside economies and countries for support

Self-reliance—a nation or region’s ability to grow enough food to feed its own population without depending on outside help

Industry—the production of goods or services, such as farming, mining, logging, and manufacturing

Artisan—a skilled worker who makes items like furniture, clothing, and jewelry by hand

Grower—a person who grows a particular type of crop (fruits, vegetables, and grains)

Types of Farmers:

- Dairy Farmers—raise cattle, goats, sheep, or other milk-producing animals
- Ranchers—raise livestock such as cattle, sheep, goats, and horses
- Poultry Farmers—raise chickens, turkeys, ducks, or geese for meat, egg, and feather production

Potential Human Health Issues:

- Meningitis—an acute inflammation of the protective membranes covering the brain and spinal cord that can be life threatening (the giant African snail can carry a parasite that can transmit this disease to people)
- Insect stings—painful wound caused by an insect’s stinger and venom

THE DEVASTATING EFFECTS OF INVASIVE SPECIES

Invasive species can:

- Push out native species.
- Place other species at increased risk of extinction.
- Reduce biological diversity.
- Kill forest trees.
- Alter wildfire intensity and frequency.
- Damage crops.
- Cost industry and government millions of dollars in treatment expenses.
- Prevent the sale of products from infested areas.
- Create economic dependency on products from other countries.
- Threaten the jobs of farmers, artisans, builders, and others who depend on agricultural and forestry products.
- Endanger personal health (e.g., stings from **imported fire ants** or meningitis from **giant African snails**).

Have students research the card they selected using the **Exploring the Threat** research sheet (Student Handout 3).

- *What is the threat?*
- *What kind of threat is it? (Environmental, Economic, Human Health)*
- *How is this threat connected to the environment, the economy, or human health?*
- *How does this threat cause concerns for the environment, economy, or human health?*
- *What are some of the unintended consequences of the problem?*

Tip! **GUEST SPEAKERS** Invite local farmers, growers, artisans (who depend upon natural materials), or builders to the class as guest speakers. Have them explain their job to students and reflect on the potential damage invasive species could cause to the work they do.

After students have researched their individual card, they can move into larger groups based on the overall categories (environment, economy, and human health) and create a group presentation to share what they've learned with the rest of the class.

Tip! **MIX IT UP!** Invite students to get creative when presenting their research. For example, they could create a commercial, song, skit, or poster.

ONLINE RESOURCES

- **www.HungryPests.com**, USDA's public outreach Web site on the invasive species threat and how people can "Leave Hungry Pests Behind"
- **www.invasivespecies.gov**, the official Web site of The National Invasive Species Council, which provides high-level interdepartmental coordination of Federal invasive species actions
- **www.invasivespeciesinfo.gov**, a National Agricultural Library Web site established in 2005 to meet the information needs of The National Invasive Species Council and other users
- **www.asianlonghornedbeetle.com**, USDA's public outreach Web site on the Asian longhorned beetle
- **www.saveourcitrus.org**, USDA's public outreach Web site on foreign citrus diseases
- **www.smokeybear.com/wildfires.asp**, Smokey Bear's official Web site for kids, which provides a wealth of information about forest fires
- **www.ready.gov/kids/know-the-facts/wildfires**, a kid-focused Web site of the U.S. Department of Homeland Security's Federal Emergency Management Agency that explains the threat of wildfires

Tip! THREAT CARDS EXTENSION ACTIVITIES

- Have students answer the prompt on their threat card in their journals. After students are finished, they can share their response with a peer or invite students to read them aloud to the class.
- Use the prompts on each threat card for longer and more indepth personal research projects.
- Explore the connections between threat cards by creating “story webs.” Students should explain their thinking with each connection. For example:
 - Dead forest trees could lead to more wildfires.
 - Damaged crops could threaten the jobs of farmers and artisans. Forest pests could harm builders who may need to pay more for certain lumber.

Turn it into a game by rewarding the student who can identify the most connections.

- Laminate the cards to prolong their use.

DID YOU KNOW?

Invasive pests and diseases take a serious bite out of the U.S. fruit and vegetable industry each year.

While the exact number may be hard to nail down, losses certainly reach into the billions of dollars. For just one disease (**citrus greening**) in one State (Florida), the losses are alarming: more than \$4.5 billion was lost in citrus production from the 2006/07 to 2010/11 production seasons, according to University of Florida research. In Texas, the **imported fire ant**—a pest for a variety of crops, including fruits and vegetables—costs the State \$1.2 billion annually, according to Texas A&M University AgriLife. And nationwide, a 2005 study calculated the annual cost of invasive species in all economic sectors to be close to \$120 billion.

Reflection + Evaluation

7. (Wrap Up) Why Should I Care?

At the end of the lesson, have students reflect upon the impact invasive species can have on them personally by writing a journal entry in response to the prompt: “I care about invasive species because...” Require students to include text references from the *A Day in Your Life With Invasive Species* blog post and the research they did in the *Exploring the Threat* activity.

Tip! DIGITAL CLASSROOM Have students post their journal entries on a class blog or create a new “Invasive Species” blog to share all their writing for the unit. Invite students to create a clever and catchy blog name and Web address.

Extensions

Vin's Vocabulary

Collect new and unknown invasive species vocabulary to add to a classroom list. Vocabulary may include: agriculture, certified, compliance, entomology, eradicate, infestation, invasive, native/non-native, quarantine, regulations, safeguard, smuggle, species, and USDA. Once the word is added to the list of "Vin's Vocabulary," give students points for each time they use one of the words in a class discussion or in writing. At the end of the unit, name the student with the most points the Ultimate Vin's Vocabulary Champ!

Protect Your Environment Trek

Go on a nature walk and observe the native species that can be or are impacted by invasive species. Students can prepare for the trip by visiting the pest profiles on **www.HungryPests.com** to research host plants and creating a checklist of those native to their area. As students identify items on their checklist, ask them to pause and consider why these plants are important and what would happen if invasive species threatened them. After the trip, students can write in their journals about how the trip might have affected their view of the local environment.

Natural Resources Research: Wood Is Wood, Isn't It?

To explore how invasive species can impact a widely used natural resource (wood), have students research and explore different tree species, where they grow, and how various woods are used in their community, in our country, and in products they use on a daily basis.

What's Up With Wildfires?

Investigate wildfires—another way, aside from invasive species, that natural resources are threatened. Students can research and discuss local stories or events caused by wildfires and visit both the **Federal Emergency Management Agency** Web site (www.ready.gov/kids/know-the-facts/wildfires) and the **Smokey Bear** Web site (www.smokeybear.com/wildfires.asp) to learn more.

Hungry Pests on the Prowl

Define the five types of relationships in the animal and plant kingdoms (i.e., mutualism, predation, parasitism, competition, commensalism). Then, identify which one describes the relationship between hungry pests and the plants they like to eat (parasitism).

No Pests Taste Test

Plan a class Hungry Pests Potluck featuring food that could be threatened by invasive species, and invite the school's administration and staff to join in. Food could include: oranges, orange juice, grapefruit, limes, lemons, grapes, corn, eggplant, lima beans, bananas, avocados, apricots, peaches, tomatoes, walnuts, rice, noodles, and other items impacted by hungry pests. Students can create a menu or make cards to place next to each food noting the invasive species that attack it.

#HungryPests

Invite students to stay current on hungry-pest news and the adventures of Vin Vasive by liking "Hungry Pests" on Facebook or Twitter (@HungryPests) and sharing updates with their friends. Depending on your classroom technology policy, have students use their smart phones as "palmtops" (laptops in the palms of their hands) at key moments during the lesson to tweet and post what they are learning about invasive species.

AT-HOME CONNECTION:

FAMILY AND FRIENDS INVITED!

Plan the potluck for a time that will work for family and friends (like weeknights or weekends). Students can create personalized invitations to the Hungry Pests Potluck that contain interesting facts about invasive species and food.

Dear Students,

I'll tell you, this is one great state. But it hasn't been a walk in the park. I mean, they call me "invasive species." Nice, huh? or, hungry pests. Like I'm some kind of bad guy or something. I mean, do I look invasive? No! You should think of me as a culinary tourist, a footloose foodie of your fields and trees. I just want to sample the locale fare. Just a taste! And I'm not the pushy type. People help me get around, mostly on the things they move and pack. Did you know I'm completely vegetarian? Yeah, very healthy! Hungry Pests, yeah right! Oh, gotta run! I do have a lot of mouths to feed.

Love,
Vin





PUSH OUT NATIVE SPECIES

What native species are in
your community or State?

PLACE OTHER SPECIES AT INCREASED RISK OF EXTINCTION

What species are at risk of extinction
in your community or State?

REDUCE BIOLOGICAL DIVERSITY

What is biological diversity?
Why is biodiversity important?

KILL FOREST TREES

What native trees grow in
your community?

ALTER WILDFIRE INTENSITY AND FREQUENCY

What kind of damage do wildfires cause?
How often do wildfires happen in
your community or State?

DAMAGE CROPS

What crops (fruits and vegetables) grow
in your community, State, or region?
What are your favorite
fruits and vegetables?



COST INDUSTRY AND GOVERNMENT MILLIONS OF DOLLARS IN TREATMENT

What do you think the Government should spend money on?

CREATE ECONOMIC DEPENDENCY ON PRODUCTS FROM OTHER COUNTRIES

What species are at risk of extinction in your community or State?

ENDANGER PERSONAL HEALTH

(stings from imported fire ants, meningitis from giant African snails, severe skin burns/blindness from giant hogweed sap)

What activities would you miss out on if you got sick?

PREVENT THE SALE OF PRODUCTS FROM INFESTED AREAS

What agricultural products (dairy, meat, fruit, vegetables, nuts, grains) do you rely on from other States?

THREATEN THE JOBS OF FARMERS, ARTISANS, AND BUILDERS

Do you know anyone who is a farmer?
Artisan? Builder?

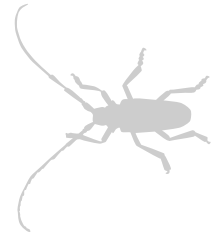
IMPACT GLOBAL TRADE

How can a change in imports or exports threaten our food security?

Name: _____ Date: _____

DIRECTIONS:

After reading the *Attack of the Invasive Species* factsheet, answer the following questions about invasive species. Remember to use textual evidence.



1) What are invasive species? _____

2) Do you think invasive species would make good pets? _____

3) What does APHIS stand for? _____

4) Why are invasive species threatening? _____

5) How do invasive species travel? _____

6) Who wrote the factsheet text? Why does the author care about invasive species? _____

7) How does APHIS protect the United States from invasive species? _____

8) What are some ways people can stop the spread of invasive species? _____

Name: _____ Date: _____

A Day in Your Life With Invasive Species

Posted by Greg Rosenthal, Public Affairs Specialist, USDA's Animal and Plant Health Inspection Service, on April 2, 2013 at 11:24 AM



USDA has proclaimed April to be Invasive Plant Pest and Disease Awareness Month, so this is the perfect time to consider how invasive species can crawl, swarm or ooze their way into your daily life. The fact is, invasive pests and diseases hunger for many of the same things we enjoy each day. And as they feast on America's agricultural and natural resources, they can devastate crops and forests, throw ecosystems out of balance and lead to lost jobs and closed export markets.

So let's follow a day in your life with these invasive species, starting right at the breakfast table. You savor your glass of orange juice at breakfast. Citrus greening disease also loves America's citrus trees—to death, costing Florida's citrus industry billions of dollars and thousands of jobs. You pour maple syrup over your pancakes. If Asian longhorned beetles had their way, they'd be enjoying those maples, too—as they eat them from the inside out. This tree killer, now in Massachusetts, New York, and Ohio, threatens forest resources valued at billions of dollars.

After breakfast, you might relish spending time in the garden or backyard. The giant African snail won't want to leave your landscape because it can munch on 500 different types of plants. This slimy pest, which can carry a parasite that can cause meningitis in people, was detected in Florida in 2011. USDA and the state are actively eradicating it and have collected and destroyed more than 115,000 snails.

Invasive pests and diseases prefer many of your lunchtime favorites. Exotic fruit fly maggots can't resist apples, pears, and dozens of other fruits and vegetables. In Florida, Texas, and California, USDA and its partners have eradicated numerous exotic fruit fly outbreaks over the last several decades before they could wreak havoc on crops.

The afternoon is a great time for a baseball game. But the sound of an ash bat smacking a ball into the stands could be silenced. The emerald ash borer beetle, detected in 18 States, has destroyed tens of millions of ash trees so far.

So it's plain to see why USDA has dedicated an Invasive Plant Pest and Disease Awareness Month. We don't want these destructive invasive species to shadow you as you go about your daily life.

Name: _____ Date: _____

DIRECTIONS:

Using the *Exploring the Threat* card you selected, research the threat listed on your card.

What is the threat?

What kind of threat is it?

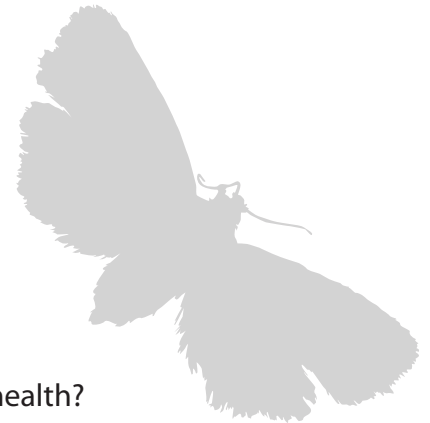
☐ Environmental ☐ Economic ☐ Human Health

How is this threat connected to the environment, the economy, or human health?

How does this threat cause concerns for the environment, economy, or human health?

What are some of the unintended consequences of this problem?

Draw an image of how this problem can cause unintended consequences to other environmental or economic systems. Use pictures, arrows, and words to describe how this threat is connected to people and the environment.





LESSON 2

MEET THE PESTS

GRADE 6–8

Lesson Overview:

Now that students have been exposed to the threat invasive species pose in their lives, they'll get to know the individual pests more—what they look like, what they threaten, where they live, and where they might pose a threat.

Topic:

Exploring different invasive species and the specific threats they pose

Subject Connections:

Science, English Language Arts, Social Studies, Math

Suggested Timing:

Three 45-minute class periods

- **First Class**—Wanted! The Pest Files research project
- **Second Class**—Hungry Pests Detectives Timeline
- **Third Class**—Map It Out! Invasive Species in the United States; Hungry Pests Re-Cap

Note: Extra class periods can be added to accommodate more time for research during the **Pest Files Research** activity.

Supplies:

- Access to computer lab, computers, and Internet connection
- White banner paper or large map of the United States
- Manila file folders (three per student)
- Collage materials
- Student Handouts:
 1. **Pest Files Research**
 2. **Hungry Pests Detectives Timeline**

Preparation:

- Make copies of the **Hungry Pests Detectives Infographic** worksheet for each student.
- Make three copies per student of the **Pest Files Research** worksheet.
- Provide three manila “pest files” folders per student.
- Download and print copies of APHIS’ **Hungry Pests Profile Cards** at www.HungryPests.com/partner-tools.

Learning Objectives:

Students will...

- Identify and describe various invasive species.
- Identify where invasive species have been introduced.
- Explain which invasive species pose a local threat.
- Describe the process of discovering, reporting, and publicizing the presence of an invasive species.
- Collect, analyze, and interpret different kinds of data.
- Create a map of the United States.

Essential Questions:

What are some of the specific invasive species to watch out for and why?

What do they look like? Where would I find them?

Which invasive species are threatening my community and State?

Introduction

1. Wanted! The Pest Files

Have students build on their invasive species knowledge by getting to know individual pests better. Ask them to take on the role of “invasive species investigators” and select three invasive pest threats they are interested in learning more about. These can be pests that are in their State or neighboring States or pests from the targeted 15 invasive pests listed on www.HungryPests.com.

Note: Depending on class size, students could work in teams. Make sure that the class covers as many different species as possible to complete a full classroom set. If there is more interest in certain pests than others, have students randomly draw their three pests from a hat.

The following Hungry Pests are most likely to be moved accidentally by the general public:

- Asian citrus psyllid
- Asian longhorned beetle
- Citrus greening disease
- Emerald ash borer
- European grapevine moth
- European gypsy moth
- False codling moth
- Giant African snail
- Imported fire ant
- Khapra beetle
- Light brown apple moth
- Mediterranean fruit fly
- Mexican fruit fly
- Oriental fruit fly
- Sudden oak death

IMPORTANT! Because Hungry Pests are always on the move, this list is always changing! Check www.HungryPests.com for the latest list.

Tip! **HUNGRY PESTS IN YOUR STATE** Visit www.HungryPests.com/the-spread to see which pests are specifically threatening your community, State, and neighboring States.

After students have chosen the three pests they want to focus on, they can begin to assemble “clues” about each pest by researching and gathering information from existing APHIS resources (see below). Clues will include where the pest is found, what it threatens, where it originates, signs and symptoms, and (to be completed in Lesson 4) what people can do to stop the spread.

Pest Files Research Resources

- Hungry Pests Web site: www.HungryPests.com
- Pest Profile Cards: www.HungryPests.com/partner-tools
- Quarantine Maps: www.HungryPests.com/the-spread

Have students use the **Pest Files Research** worksheet (Student Handout 1) to collect all of the clues and document their research. As they complete the worksheet, ask students to leave the last section (“What you can do to stop the spread”) blank for now. Students will revisit that question in Lesson 4.



Tip! **INCLUDE DIFFERENT LEARNING STYLES** The *Pest Files Research* worksheet is provided as a guide for students to collect information. Encourage students to use other learning styles to share their research. Students could make charts or graphs, write or perform a song or poem, or come up with other creative ways to communicate what they learned.

Pest Files Research Worksheet

- Name of pest
- Sketch of pest
- Where it poses a threat
- What is at risk
- Pest origin
- Signs and symptoms
- What you can do to stop the spread

DID YOU KNOW?

Cryptic Pests: Students might be interested to learn that some pests are considered “cryptic.” This means they are found inside of plants and not easily seen without microscopes or laboratory equipment.

For example, a fruit fly maggot or false codling moth larvae would be inside the fruit and would not be visible by just looking at the fruit. Some plant pathogens like citrus greening may not be apparent for years before symptoms appear. Plum pox virus is another cryptic pest that requires molecular diagnostics to confirm plant infection.



LARVAE OF MEDITERRANEAN FRUIT FLY
INSIDE FRUIT

Tip! **CAREER CONNECTIONS** As students are working on their pest files, take the time to connect their research to future career pathways.

- **Scientific Illustration:** Students who become interested in drawing and sketching the pests will be excited to learn that being an insect or botanical illustrator is a viable career option. These illustrators create detailed drawings for scientific research and textbooks.
- **Computer Mapping and GIS:** Students who enjoy mapping the pest locations will be interested in the wide range of career opportunities involved in creating maps and analyzing their results. GIS (geographic information system) is sophisticated software used to capture, manipulate, manage, and present many different kinds of geographic data, including pest locations.

Have students create “pest files” for each of the three pests they select using manila folders and the *Pest Files Research* worksheet.

Tip! **GATHERING EVIDENCE** Invite students to get creative with their pest files and include additional images, notes, articles, and information they find during their research. Have students create collages using what they collect.

After students have completed their pest files, they can present their files to the class. After all of the pests have been presented, ask students to reflect on all of the pests they’ve researched and identify the pests they think are the most damaging and why. Have students pick a location in the classroom to display their pest files.

EXTENSION ACTIVITY

Students can identify their favorite pest from their pest files research and delve even deeper to become experts on that pest. Have students work in groups to create a detective-style skit that shares what they’ve learned about the pest with the rest of the class. Invite them to create scenarios that involve crime scenes, suspect interviews, and evidence collection.

Exploration + Research

2. Hungry Pests Detectives Timeline

Introduce students to the process of Hungry Pests detection. Write the following list of “How Hungry Pests Are Detected” on the board, and have students discuss each step.

How Hungry Pests Are Detected

1. Often, a regular person (like you or me) is the first to notice an invasive pest (in the garden or at a park, on a walk, while camping, or during similar activities.) Federal or State pest survey specialists or farmers also find signs of plant pests and diseases.
2. Sightings are then reported to the local land manager or local USDA office (www.aphis.usda.gov/planthealth/sphd).
3. If it is a first detection in the entire country, the reporting has to go through an important “Chain of Custody.” Chain of custody means that the movement of the sample is tracked and documented as it goes through the identification process and that only authorized agricultural officials can make the final confirmation.
4. USDA scientists identify the pest, confirming the detection. A DNA analysis may be performed.
5. If needed, information such as photos from a microscope or the sample itself may be sent to the Smithsonian Institution to confirm the identity.
6. Information is then sent to various databases, organizations, and individuals to help notify other interested people or groups of the detection.
7. In conjunction with State partners, USDA announces the detection to the world.

To better understand how invasive species are detected, reported, confirmed, and recorded, have students create a timeline of the process using the **Hungry Pests Detectives Timeline** worksheet. Ask them to document each step of the process and visually explain what happens in each step with a drawing. Encourage students to think about how to communicate this information creatively.

After students have created their individual timeline using the **Hungry Pests Detectives Timeline** worksheet (Student Handout 2), have them work collaboratively to create a giant timeline using chart paper. Have students split into smaller groups, with each group focused on a separate step of the process.

After all groups are finished, have them present their step of the process in order. Hang up the timeline in the school’s hallways or cafeteria to educate passing students and staff on the pest detection process.

AT-HOME CONNECTION:

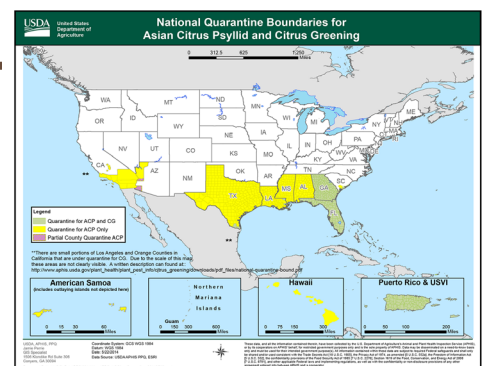
ON-THE-GO TIMELINE

After students are finished with their **Hungry Pests Detectives Timeline** worksheet, have them take it home and share it with their family. Students can work with their family to decide an appropriate place, such as a refrigerator or bulletin board, to post the timeline so that everyone in their family can reference the process if they ever discover an invasive pest. Provide extra credit to students who bring in pictures of their timeline displayed in their house and initialed by their parents!

Main Activity + Assessment

3. Map It Out—Invasive Species in the United States

Explain to students that once an invasive species is detected and confirmed, one way the information is communicated to the public is through mapping. To gain an awareness of where and which specific invasive species can be found within the United States, students can draw a large map of the country on banner paper and label each State (or use a large, existing physical U.S. map).



DID YOU KNOW?

Maps can also be used in climate risk analyses that try to predict areas of the United States that may be at risk for introduction of a pest or disease.

Direct students to the interactive State maps on www.HungryPests.com/the-spread and current APHIS maps to identify which of the 15 targeted invasive species are under Federal quarantine in each State. A quarantine establishes an area within which a quarantine pest is present and is being officially controlled. Potentially infested or infected materials may not be allowed to leave the quarantine area or may need to be treated, inspected, and given a certificate or permit before leaving. (**Note:** Explain to students that the APHIS maps only show pests for which Federal quarantines have been established. It is possible that other pests exist and have been detected but don't have Federal quarantines.)

Have students sketch each pest or cut out the Pest Profile Cards (www.HungryPests.com/partner-tools) and start by placing on the map the pests that are under Federal quarantine in their State. They can then move on to neighboring States until pests have been placed in every State where they are under Federal quarantine.

Tip! **GEOGRAPHY CONNECTION** Use this activity as an opportunity to create a cross-curricular connection to social studies and geography. Emphasize the importance of using geographic tools like maps to collect, analyze, and interpret different kinds of data.

This lesson is also a great opportunity to help students learn more about biodiversity and connect to agriculture and ecology. As students complete the map, ask them to discuss what grows where, what is natively grown in each State, and what has been introduced.

Looking at the entire United States, have students analyze and interpret the pest data they are mapping. Ask them to observe and hypothesize: *Which States have the most quarantines? Which States have the least? Why do you think that is?*

DID YOU KNOW?

Factors contributing to pest quantity include the volume of international trade and travel, climate, and proximity to infestations.

Next, have students look specifically at their own State and community and discuss the findings. Ask them to observe and hypothesize: *What invasive or non-native pests are found in your State? Why do you think that is?* Remind students that reported or mapped detections don't necessarily indicate spread. If pests or diseases are detected in a location, USDA will begin looking in other areas where they could become established and, as a result, more pests may be detected. However, it can be difficult to determine whether pests or diseases found at one location came from an existing infestation or another source. Separate introductions from different sources might have occurred.

When the map is completed, display it in the cafeteria, school hallway, or another location where there is a lot of student traffic. Have students make it interactive by posting questions about invasive species for the school community to ponder while viewing the map.

Tip! **MATH CONNECTION—MEET COMMON CORE!** Use this activity as an opportunity to create a cross-curricular connection to math, studying ratios and describing distributions.

Pest Ratios:

- Have students use ratio language to create ratio relationships between two pest quantities found on the map. For example, “The ratio of pests in Texas to Michigan was 3:1, because for every pest Michigan had, Texas had 3.”

Pest Statistics:

- Help students write their own statistical questions using the map they created as a data set. (For example, “How many invasive or non-native pests are in my State?”) Remind them that a statistical question anticipates variability in the data related to the question and accounts for it in the answers. After they’ve created their question, have them pass it to their neighbor to solve.

Reflection + Evaluation

4. Hungry Pests Re-Cap

At the end of the lesson, invite students to reflect on what they learned about invasive species during their research. Ask each student to write on a sticky note at least one thing that surprised him or her. Have students post their takeaways on the wall and read what their peers posted. After they’ve read what everyone else has written, ask students to identify three to five overall “umbrella themes” and group similar notes under the appropriate theme. Example umbrella themes include: Pest Locations, Pest Threats, Pest Descriptions.

Extensions

Up Close and Personal

Using bug nets or plastic containers, have students travel outside the classroom to collect insects around their school. With magnifying glasses, students can explore the insect’s anatomy and create diagrams of what they see using appropriate vocabulary (such as antenna, thorax, abdomen, tibia, etc.). Ask students to compare the pests they find to the insects they researched during the **Pest Files Research** activity: *Did you find any invasive species? How do you know?* Make sure students safely release the insects when they are done.

Make Your Own Vin Vasive

To better recognize hungry pests and further students’ knowledge of insect anatomy, have students use art to create large 3-D paper-maché replicas, masks, drawings, or posters of each pest. Scientifically label each part of the insect body (antenna, head, compound eye, thorax, abdomen, leg, wing, etc.) and discuss each part’s form and function. Remind students that other creatures have these parts, too, not just invasive pests. Use existing Pest Profile Cards as resources (www.HungryPests.com/partner-tools). When finished, display the pest creations around the school to raise awareness about invasive species.

(See summer camp lesson “Masked Vin Vasive” for more activity details: www.HungryPests.com/partner-tools/HP-YouthActivity.pdf).



Who Am I? “Guess the Hungry Pest” Game

To put new knowledge of invasive species to the test, have students play this fast-paced guessing game. Pin different Pest Profile Cards (www.HungryPests.com/partner-tools) to each student’s back, making sure not to show students the card in the process. Have students move around the room asking their peers “yes” or “no” questions about their hidden pest’s identity until they are able to correctly guess which pest is pinned on their back. Allow students to use their pest files (completed at the beginning of the lesson) as a reference during the game.

Be a Pest

Invite students to use their creative writing skills by creating a short story from the perspective of an invasive pest. Encourage them to choose a pest they are interested in learning more about. Have students consider what the pest’s daily routine is, what challenges it faces, and what its goals are. Require students to include figurative language (such as imagery, simile, metaphor, alliteration, personification, onomatopoeia, hyperbole) and sensory details (sight, hearing, touch, smell, taste), plus at least three facts from the Hungry Pests Web site. Share the examples below for the **giant African snail**. They can also create a class Hungry Pests blog to share their creative writing and research.

Giant African Snail Creative Writing Examples:

- Figurative language (simile): The **giant African snail** moved as slowly and sluggishly as a turtle.
- Sensory details (sight): The **giant African snail’s** shell was a brownish color with darker brown stripes.
- Facts:
 - The **giant African snail** consumes at least 500 types of plants.
 - The **giant African snail** can cause structural damage to plaster and stucco structures.
 - The **giant African snail** can carry a parasitic nematode that can cause meningitis in people.

Beetle Busters!

- **For Students:** To learn more about one specific hungry pest, the **Asian longhorned beetle**, have students visit USDA’s **Asian Longhorned Beetle** Web site and play the fun and fast-paced online game *Beetle Busters: Freeze and Collect* (www.asianlonghornedbeetle.com/wp-content/themes/beetlebusters/game.html).
- **For Teachers:** Visit USDA’s **Asian Longhorned Beetle** Web site (www.asianlonghornedbeetle.com/get-involved/educate) to download *An Educator’s Guide To Stopping the Asian Longhorned Beetle*. The guide features additional inquiry-based and cross-curricular pest activities that are classroom-ready.




Name: _____ Date: _____

DIRECTIONS:

Complete *Pest Files Research* worksheets for as many hungry pests as possible.
Visit www.HungryPests.com for help during your research.



| | | |
|---|---|----------------------------|
| Pest Name: | Pest Location: (Color in States where the pest has been detected.) | |
| Sketch the pest here: |  | |
| What's at risk? <ul style="list-style-type: none"> • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ | Where does the pest originate? | Signs and symptoms: |
| What you can do to stop the spread: (Lesson 4) | | |

Name: _____ Date: _____

DIRECTIONS:

Unscramble the steps of detecting and reporting a hungry pest, and create a timeline documenting the process from beginning to end. Create a visual to explain what happens at each step.

**HUNGRY PESTS DETECTIVES: PROCESS BANK**

- **Send to Smithsonian**—If needed, information such as photos from a microscope or the sample itself may be sent to the Smithsonian Institution to confirm the identity.
- **Sightings Reported**—Sightings are reported to the local land manager or local USDA office.
- **Announcement**—USDA and State partners announce the detection to the world.
- **“Chain of Custody”**—If it is a first detection in the United States, the reporting goes through an important “Chain of Custody.”
- **Pest Sighting**—A regular person (like you or me) is the first to notice an invasive pest (in the garden or at a park, on a walk, while camping, or during similar activities).
- **Scientist Confirmation**—USDA scientists identify the pest, confirming the detection. A DNA analysis may be performed.
- **Identity Send to Databases**—Information is then sent to various databases, organizations, and individuals to help notify other interested people or groups of the detection.



LESSON 3

INVASIVE SPECIES ON THE MOVE

GRADE 6–8

Lesson Overview:

This lesson explores the many pathways hungry pests use to enter new locations, establish, and spread, as well as the efforts already in place to stop them. Students will understand more clearly why it's important to track the pests' spread, how big of an effort and undertaking it is, and how people can make the problem worse—often unknowingly.

Topic:

Discovering how invasive species spread and what is being done to stop them

Subject Connections:

Science, English Language Arts, Social Studies

Suggested Timing:

Three 45-minute class periods

- **First Class**—Vin Vasive's "Top 8 Ways I Spread;" Pest Pathway Storyboards
- **Second Class**—USDA vs. Invasive Species
- **Third Class**—Breaking News!; 3-2-1 Pests!

Note: Extra class periods can be added to accommodate more time for writing during the **Breaking News!** activity, and research during the **USDA vs. Invasive Species** activity.

Supplies:

- Sticky notes
- Collage materials
- Access to computer lab, computers, and Internet connection
- Student Handouts:
 1. **Vin Vasive's "Top 8 Ways I Spread" Infographic**
 2. **Pest Pathway Storyboard**
 3. **USDA vs. Invasive Species**
 4. **Breaking News!**

Preparation:

- Download and print copies for each student of USDA's press release, "USDA Dedicates April to Increasing Awareness on How to Stop Invasive Pests from Spreading," at www.aphis.usda.gov/newsroom/2013/04/pest_awareness_month.shtml.
- Make copies of student handouts for each student.

Learning Objectives:

Students will...

- Understand how invasive species enter new locations and spread through common pathways.
- Describe the efforts of USDA and local State agencies in stopping the spread of invasive species.

Essential Questions:

How do invasive species enter new locations and spread?

What is USDA doing to fight these hungry pests?

What is my State doing to fight invasive species?

Introduction

1. Vin Vasive's "Top 8 Ways I Spread"

Introduce students to the top ways that hungry pests enter new locations and spread (also known as pathways) by sharing **Vin Vasive's "Top 8 Ways I Spread" Infographic** (Student Handout 1). **Pathways** are any means that allow the entry or spread of a pest or disease. Pathways could be plants, plant parts, agricultural products, wood packaging, soil, containers of all kinds, or vehicles that are contaminated with pests, disease-causing microbes, or seeds from harmful weeds. People can accidentally move these dangerous, invasive hitchhikers across countries, continents, and oceans.



DID YOU KNOW?

International trade is the system of importing and exporting goods by ships at our seaports, cargo planes at our international airports, and trucks and trains crossing our land borders. With the staggering volume of international trade, invasive species have an unprecedented opportunity to cross great distances—hundreds or thousands of miles—on a daily basis.

Ask students the following inquiry-generating questions to get them thinking about the impact of international trade in their lives:

- What ports do you live near?
- Which U.S. ports do you think are the busiest? Why?
- Why is international trade a game-changer for the movement of invasive species?

Distribute copies of the infographic to each student. Have different students volunteer to read each pathway aloud to the class. Pause after each and ask students to raise their hands if they have had any personal experience with the pathway. (For example: *Does your family own an RV? Have you ever gone camping and used firewood?*)

INTERNATIONAL PATHWAYS

- International cargo
- Passengers and their baggage
- Airplanes
- Trucks
- Trains
- Ships
- International garbage
- Ballast water (water stored within a ship's hull for stability)
- Smuggling
- Mail parcels

Exploration + Research

2. Pest Pathway Storyboards

Using **Vin Vasive's "Top 8 Ways I Spread" Infographic**, have students select one pathway to explore further. (Note: Make sure that every pathway is accounted for among students.) Students can use the **Pest Pathway Storyboard** worksheet (Student Handout 2) to create a storyboard that tells the story of their pathway. For example, how might a pest use firewood to enter a new location and spread? Outdoor furniture? Plant parts? Have students research their pathway online and collect any information that will be helpful when creating the storyboard.

After students have finished their research, have them transfer the information they gathered into a three-part storyboard. Students can draw each image or create collages using magazine clippings and cut paper. Share the following as an example:

1. Before: What was the situation like before the invasive species was introduced?

Example: Citrus is plentiful and local farmers are profiting from its sale.

2. Pest Introduction (Cause): How is the hungry pest introduced? Where does it come from? (Pathway)

*Example: An international traveler accidentally brings a **Mediterranean fruit fly (or Medfly) maggots** hiding on undeclared fresh fruit into the United States.*

3. After (Effect): What happens to the situation now that the invasive species has been introduced?

*Example: The **Medfly maggots** begin to feed inside fruits and vegetables like citrus and peppers, causing them to spoil and rot! Local farmers are unable to sell the damaged citrus as they usually would, and their jobs become threatened.*



Tip! **STORYBOARD BASICS AND INSPIRATION** Explain to students that storyboards are graphic organizers that use a sequence of images and captions to explain a story in chronological order. They are often made to guide the creation of a commercial, movie, or animation. They are also used in comic books or graphic novels. To help inspire students with their storyboards, find examples of movie, comic, or graphic novel storyboards online to share with students. Then, have students discuss the pros and cons of using only illustrations to tell a story.

Once students have completed their storyboards, have them group the storyboards by pathway and display them on a classroom wall. Give each student a small stack of sticky notes to list different ideas on each storyboard about how the pest might have been stopped. For example, people can help stop the spread of pests via outdoor gear by making sure to clean their shoes before leaving a camping trip.

After students have had enough time to post their ideas, ask them to share some of them with the class. Explain to students that they will further explore different tactics for stopping the spread of invasive pests in Lesson 4.

RESEARCH RESOURCE

To aid students during their pathway research, invite them to visit www.HungryPests.com/how-they-spread/index.php, an interactive Web page with descriptions of each pathway.

3. USDA vs. Invasive Species

Now that students have a better understanding of how invasive pests spread, have them investigate what USDA is doing (in the United States and abroad) to stop pests from spreading. Students can work in pairs to research USDA's efforts to eradicate five different hungry pests. (See list below for sample pests and research links.) Have them use the **USDA vs. Invasive Species** worksheet (Student Handout 3) to organize the information they find.

Sample pests:

- Plum pox virus
(Go to www.aphis.usda.gov, and click on "Plant Health." Next, click the "Pests and Diseases" link at left, and then "Pest and Disease Programs" in the center of the page. Scroll down the new page to the "Plum Pox" link.)
- Asian longhorned beetle
(www.invasivespeciesinfo.gov/animals/asianbeetle.shtml)
- Karnal bunt
(Follow the directions for plum pox virus above, but scroll down to the "Karnal Bunt" link.)
- Boll weevil
(Follow the directions for plum pox virus above, but scroll down to the "Cotton Pests" link.)
- Khapra beetle
(www.invasivespeciesinfo.gov/animals/khapra.shtml)
- European grapevine moth
(www.invasivespeciesinfo.gov/animals/egvm.shtml)



EUROPEAN GRAPEVINE MOTH

DID YOU KNOW?

Share with students the following successful examples of USDA's successful pest eradication efforts.

- **Plum pox virus** attacks stone fruit (peaches, plums, and even almonds!) and is the most devastating stone fruit disease in the world. The spread of plum pox virus in the United States could jeopardize our country's nearly \$1.4 billion stone fruit industry. After the discovery of this disease in Pennsylvania—the first-ever detection of it in the United States—the Secretary of Agriculture declared an emergency to carry out an eradication program in the State. Plum pox virus was ultimately eradicated in Pennsylvania by surveying and sampling leaves of stone fruit trees, cutting down all positive trees, and creating a buffer zone around them. The disease was also detected and eradicated in Michigan, and as of May 2014, USDA was working to eradicate plum pox virus in New York as well.
- **Karnal bunt** is named for a place in India where fungal disease was first discovered. It infects wheat and, if in high enough concentrations, can make wheat smell fishy! (Did you know donuts are made with wheat flour? Who wants to eat fishy donuts?) The disease used to be present in several U.S. States, but due to USDA's eradication program, it is now confined only to certain areas in Arizona.

Tip! **ECONOMICS CONNECTION** Use this activity as an opportunity to emphasize the measures USDA takes to keep pests out of the country by regulating imported commodities and other agricultural items (such as fruits; vegetables; plants; seeds; and many plant products, including handicrafts and wood crates). Some imported items are required to go through treatment (cleaning/disinfection, cold treatment, or other methods) and receive a phytosanitary certificate before they can enter into the United States. Ask students to discuss and explore the reasons why such regulations are necessary.

After students have completed the **USDA vs. Invasive Species** worksheet, ask pairs to share with the class one eradication effort from their research that they think was the most successful.

Main Activity + Assessment

4. Breaking News!

To help synthesize their research on eradication efforts, ask students to take on the role of reporters for a local newspaper. Explain that they just received breaking news from USDA about what it is doing to stop the spread of invasive species. As research, have them read USDA's press release from April 2, 2013, "**USDA Dedicates April to Increasing Awareness on How to Stop Invasive Pests from Spreading**," available online at www.aphis.usda.gov/newsroom/2013/04/pest_awareness_month.shtml.

Tip! **USDA IN THE NEWS!** Visit APHIS' newsroom (www.aphis.usda.gov/newsroom) to download more press releases and research documents to use during the lessons.

After students are finished reading the article, have them recap the following:

- What initiatives is APHIS leading to stop the spread of invasive species?
- Who does APHIS partner with?

Tip! **INTEGRATING INFORMATIONAL TEXT—MEET COMMON CORE!** Providing multiple texts on the same topic can help students experience a variety of text structures, purposes, and writing styles. The wide variety of informational texts available can also help you easily accommodate different reading levels in your classroom. (For example: a short press release on invasive species versus a complex multipage report on eradication efforts.)

Using the **Breaking News!** worksheet (Student Handout 4), students will write a short and informative article for a local newspaper on what they learned from their research and USDA's press release. Have students re-read the article and determine what information they should share through their local newspaper. Ask students to highlight specific quotes they would like to feature.

Tip! **QUOTE SANDWICHES** As students are writing their news articles, push them to create "quote sandwiches" with the quotes they choose from the press release. Have them introduce the quote in their own words and explain the quote afterwards with a supporting sentence.

Quote Sandwich Example: As stated in the article "USDA Dedicates April to Increasing Awareness on How to Stop Invasive Pests from Spreading," APHIS has eradicated the boll weevil from "all 17 cotton-producing States, with the exception of Texas' Lower Rio Grande Valley." This means that APHIS is working hard to get rid of invasive species, but there is still more work to be done.

AT-HOME CONNECTION: SPREAD THE NEWS!

When students have finished writing the first draft of their news article, ask them to take it home and share with their family. After family members read the article, have students interview them to collect quotes to include in their writing. Require students to include at least one quote from a family member in their final draft of the news article.

Remind students to use their **USDA vs. Invasive Species** worksheet to aid their research as “investigative journalists.”

Tip! **HUNGRY PESTS LIVE!** After students have completed the *Breaking News!* worksheet, have them act out their stories as news anchors. Invite students to dress up, create a news set, and videotape their reporting for other students to see.

Reflection + Evaluation

5. Wrap Up—3-2-1, Pests!

At the end of the lesson, have students complete a “3-2-1 exit ticket” to recap what they learned during the lesson and help you check for individual student understanding.

Ask them to share:

- Three things they learned about the spread of invasive species,
- Two things about invasive species in their State that they’ll share with their family and friends, and
- One thing about invasive species that they still have questions about.

Revisit any misunderstandings or questions students have during Lesson 4.

Extensions

Hungry Pests Theater

Have students take the cause and effect storyboards they created earlier in the lesson and turn them into 2-minute performances complete with scripts, costumes, and/or puppets. Students can share their skits within their class or take the Hungry Pests Theater on the road and perform for younger students in their school or community.

Pathway Charades

Have students take turns silently acting out each different pathway while the rest of the class races to guess the pathway first.

Hungry Pests and Pathways

Visit www.HungryPests.com/resources/HP-YouthActivity.pdf to download “Attack of the Invasive Species!”—a fun, “tag-like” game about invasive species and their pathways. The game can be played indoors in a gym or outdoors. Divide students into two teams: Invasive Species and Nature Protectors. Locate different pathways (such as boots, plants, firewood, backpacks, hay, lawn furniture, or other items) to bring in and place in various locations around the playing field. Nature Protectors must tag Invasive Species before they reach their pathways. See full details in the online activity file.

AT-HOME CONNECTION: ONE NIGHT ONLY!

Plan a special night to perform the Hungry Pests Theater skits for family and community members. Have students create Hungry Pests tickets that feature interesting facts about invasive species and distribute these as invitations.

Name: _____ Date: _____



Firewood



Outdoor Gear



Internet Sales



Recreational Vehicles



Plants and Plant Parts



Outdoor Furniture



Passenger Baggage



Agricultural Materials

Name: _____ Date: _____

DIRECTIONS:

Select one pathway to explore further. Use the graphic organizer below to create a storyboard that shows how pests spread using the pathway. Break it up into the three steps below: Before, Pest Introduction (Cause), and After (Effect).

PATHWAY NAME: _____

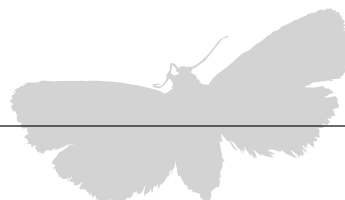
| | |
|--|--|
| BEFORE: What is the situation like before the invasive species is introduced? | |
| PEST INTRODUCTION (Cause): How is the invasive species introduced? (Pathway) | |
| AFTER (Effect): What happens to the situation now that the invasive species has been introduced? | |

Name: _____ Date: _____

DIRECTIONS:

Work with a partner to research what USDA is doing to eradicate the invasive species listed below. Write an explanation of their efforts across the United States and abroad. Make sure to cite the source of your research. **BONUS: Highlight any efforts that are happening in your State!**

| INVASIVE SPECIES | USDA EFFORTS |
|------------------|--------------|
| | Source: |
| | Source: |
| | Source: |
| | Source: |
| | Source: |



Name: _____ Date: _____

DIRECTIONS:

You've been hired as a reporter for your local newspaper! After reading the USDA press release "USDA Dedicates April to Increasing Awareness on How to Stop Invasive Pests from Spreading," write a news article sharing the information with your community. Include at least two quotes from the press release.

| | |
|--|--|
| <hr/> <i>Local Newspaper Name</i> | |
| <hr/> <i>Headline</i> | |
| <i>Author:</i> _____ <i>Article:</i> _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ | |
| | <i>Photo</i> |
| | <i>Caption:</i> _____ _____ |
| | _____ _____ _____ _____ _____ _____ |



LESSON 4

LEAVING HUNGRY PESTS BEHIND

GRADE 6–8

Lesson Overview:

USDA and individual States are doing all they can to prevent the spread of invasive species, but they need your help! It's a big job to stop Vin Vasive. In this lesson, students move into action by exploring what they can do personally to prevent the spread and how they can encourage their friends, family, and community to leave hungry pests behind.

Topic:

Empowering students to become local hungry pests ambassadors and do their part to stop the spread of invasive species in their community

Subject Connections:

Science, English Language Arts, Social Studies

Suggested Timing:

Five 45-minute class periods

- **First Class**—Seven Ways To Leave Hungry Pests Behind!
- **Second Class**—User Personas; Invasive Species Social Network
- **Third Class**—Taking Action!; Message Making
- **Fourth Class**—Spreading the Word!
- **Fifth Class**—Presenting: Hungry Pests!; A Community Plan

Note: Extra class periods can be added to accommodate more planning during the **Spreading the Word!** activities.

Supplies:

- Poster materials (markers, poster board, etc.)
- Access to computer lab, computers, and Internet connection

- Access to the Hungry Pests public service announcements (PSAs) featured in the Partner Tools section of www.HungryPests.com
- Student Handouts:
 1. **Movers and Shakers**
 2. **Message Making**
 3. **Spreading the Word! Task List**

Preparation:

- Make copies of the student handouts for each student.

Learning Objectives:

Students will...

- Understand what actions to take to stop the introduction (entry and establishment) and spread of invasive species.
- Create a community plan to raise awareness of invasive species and help prevent their introduction and spread.

Essential Questions:

What can I do to prevent the introduction and spread of invasive species?

How can I report hungry pests?

How can I teach other people what I know, and help them prevent the introduction and spread of invasive species?

Introduction

1. Seven Ways To Leave Hungry Pests Behind!

USDA has identified seven key things people can do to help prevent the spread of invasive pests. To introduce students to each of the seven tips, show them the video “Seven Ways to Leave Hungry Pests Behind” on www.HungryPests.com.

Seven Ways To Leave Hungry Pests Behind:

1. Buy Local, Burn Local. When you are camping outside and need to start a fire, buy local firewood. Invasive pests and their larvae can hide and ride long distances in firewood. Don't give them a free ride to start a new infestation. If you must move firewood (even just a short distance), make sure it has been heat-treated to kill any pests that might have been in or on it.

2. Plant Carefully. Ask your parents to avoid using plant species in their gardens that could bring invasive pests to your State. For example, orange jasmine, a common landscape plant in citrus-producing States can carry the Asian citrus psyllid! Make sure plants are purchased from reputable nurseries.

3. Don't Bring or Mail fresh fruits, vegetables or plants into your State or another State unless agricultural inspectors have cleared them beforehand.

4. Cooperate With Quarantines. Cooperate with any agricultural quarantine restrictions and allow authorized agricultural workers access to your property for pest or disease surveys.

5. Keep It Clean. Wash outdoor gear, shoes, and bikes between fishing, hunting, or camping trips. Clean lawn furniture and other outdoor items (such as swing sets, soccer balls, toys, kiddie pools, and portable sandboxes) when moving from one home to another.

6. Learn To Identify. If you see signs of an invasive pest or disease, write down or take a picture of what you see and then report it to your nearest USDA office. Visit www.aphis.usda.gov/planthealth/sphd for contact information.

7. Speak Up. When returning from international travel, tell U.S. Customs and Border Protection officers at the port of entry (airport, seaport, or land border) if you are carrying any agricultural items or food. To learn more, go to www.aphis.usda.gov/travel. You can also call USDA-APHIS at (301) 851-2046 for plant-related questions or (301) 851-3300 for animal-related questions.

After students have watched the video, split them up into eight different teams, one for each way to leave hungry pests behind. Have students work within their teams to create a large poster for their pathway. Make sure that students have a catchy “call to action” for each poster—a short description to help explain what someone can do to prevent invasive pests from spreading—and an interesting visual. Remind students to think about what will attract a viewer to stop and read the information on their poster.



ORIENTAL FRUIT FLY



EUROPEAN GYPSY MOTH



ASIAN LONGHORNED BEETLE



KHAPRA BEETLE



ASIAN CITRUS PSYLLID

Poster Checklist:

✓ Call to action

- Example: Don't mail me!

✓ Short description to explain the pathway

- Example: Invasive species like the Asian citrus psyllid can hitchhike on plants, and Mediterranean fruit fly larvae can hide inside fresh fruits and vegetables. Don't mail fruits or vegetables to friends or family unless agricultural inspectors have cleared them for you. For guidance, call your local USDA State Plant Health Director's office (contact information is available at www.aphis.usda.gov/planthealth/sphd).

✓ Interesting visual

- Example: A drawing of a package filled with fruits and vegetables with an Asian citrus psyllid on top.

Other Call-to-Action Examples:

- Going camping? Don't move firewood!
- Clean your boots and bikes!
- Think before you pack!
- When you come home from vacation, declare your fruit or beware!
- Helping with a new school garden? Plant carefully!



While the posters are in progress, hang them up for a quick class critique. Have each group present their poster and ask students to provide constructive feedback and suggestions for improvement. Have fellow students think about the following questions for each poster design: *What is the call to action? Is the pathway clear? Does the poster's visual make me want to stop and look? Is it memorable?* Make sure groups take notes during the critique and integrate any important changes into their poster design.

Tip! **GLOW AND GROW** Guide the classroom critique of student work by asking for peers to share one glow (something the poster is doing really well) and one grow (something the poster could improve upon) for each poster.

After the posters are complete, laminate and hang them up around the school to share the information with other students, teachers, and staff. Posters can also be photographed and displayed on a class blog or school Web site.

Exploration + Research

2. "Movers and Shakers"

Many people interact with invasive species without realizing it. Based on their outdoor activities, outdoor hobbies, or occupation, "movers and shakers" are people who can play a valuable role in helping to stop the spread of pests. Have students break into teams of two or three and randomly select a category from the list of people who may interact with invasive species.

Movers and Shakers:

- | | | |
|---------------------------|-----------------------|--------------------------|
| • International travelers | • Outdoor enthusiasts | • Hunters |
| • Gardeners | • Bird watchers | • Loggers and foresters |
| • Commercial producers | • Summer campers | • Growers, ranchers, and |
| • Sports players | • Urban park rangers | farmers |

Ask each student group to create a fictitious persona for the category they selected using the **Movers and Shakers** worksheet (Student Handout 1). Explain to students that this will be a valuable tool to help them better understand a specific demographic or target audience.

Tip! UNDERSTANDING A TARGET DEMOGRAPHIC Before students start working on their fictitious personas, explain what a “target demographic” is—a specific group of people to whom a business markets its products or services. Do a quick online image search to locate different examples of demographics to share. Demographic profiles are most often used as a tool for marketing and design research. (For example, a children’s clothing store might create customer profiles of different groups of kids they want to attract to their stores.) Seeing samples will help kick-start student creativity!

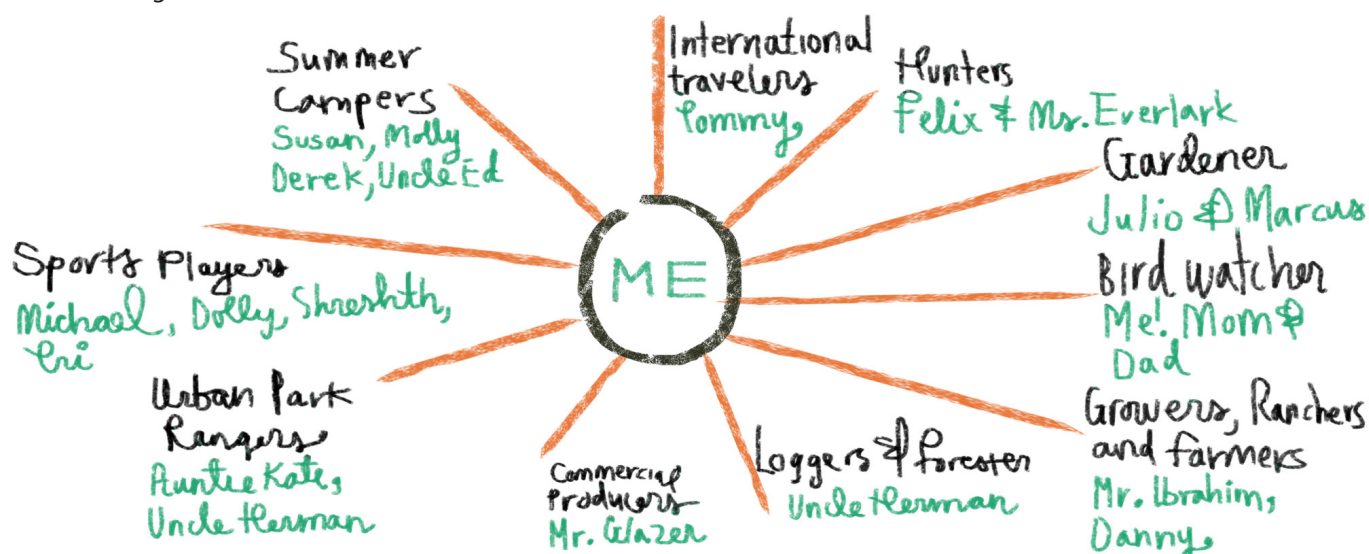
Using the **Movers and Shakers** worksheet, have students generate a creative name for each persona (for example, “Brenda the Bird Watcher” or “Frank the Farmer”), a sketch of the person, a description of what he or she does, a list of potential encounters the person might have with invasive species, and steps he or she can take to stop the introduction and spread. Share with students the sample **Movers and Shakers** worksheet as a model.

After the worksheets and personas are complete, have students share in small groups. Ask them to consider the similarities and differences between the various people profiles.

Tip! OUT IN THE COMMUNITY Have students turn their profiles into mini-flyers or posters by making copies and distributing them around the community. Ask students to think of strategic places where they can distribute their **Movers and Shakers** worksheets and share the message. For example, a student who creates a profile for a gardener could ask to hang the mini-flyer up at a local greenhouse or garden supply store. Assign students to hang their persona profile up in at least one location and document it by taking a picture.

3. Invasive Species Social Network

To help bring the profile characters closer to home, have each student create a web that maps all of the people they know (including themselves!) who fall into the above categories.



After students have created their webs, ask them to pause and consider how they could help each target audience understand the importance of stopping the introduction and spread of invasive species.

Have students pick one person in their web and create a personalized list of actions that person can take to help stop hungry pests. For example, a student who knows a gardener might remind him or her of the following actions:

- Learn more about invasive plants and avoid planting those that could bring invasive pests into your State.
- Inspect plants for signs of disease or pests before planting them. Report any signs to your local Extension office or Master Gardener program.
- When purchasing plants online or through a catalog, check first with a local USDA office (www.aphis.usda.gov/planthealth/sphd) to see if any restrictions apply.

Encourage students to include visuals (drawings or magazine cut-outs) to reinforce each action.

Once the list of actions is complete, have students discuss how they plan to share the list with the target audience. Suggestions include emailing, mailing, or delivering it in person.

Main Activity + Assessment

4. Taking Action!

As a class, have students discuss what motivates them to take action. Ask students to share an example of a cause they have supported and explain why they participated in supporting that cause. Sample causes could include homelessness in their community, recycling and the environment, or bullying at school.

Tip! **JOURNAL IT OUT** Before students share their examples with the class, have them draft a journal entry about the cause they supported. Make sure they go into detail about how they learned of the cause, how they supported it, and why it was important to them.



MEDITERRANEAN FRUIT FLY

5. Message Making

Now it's time for students to apply what they learned by launching their very own invasive species public outreach campaigns.

Tip! **FINDING PUBLIC SERVICE ANNOUNCEMENTS (PSAs)** USDA has many invasive species PSAs available on our YouTube page: www.youtube.com/user/USDAAPHIS/videos. The Ad Council (www.adcouncil.org) is another great place to look for PSAs about topics ranging from digital literacy to energy efficiency.

To prepare students for creating their own invasive species outreach campaign later in the lesson, have students discuss and evaluate existing PSAs.

Tip! **REPLAY!** Shorter PSAs can pack a lot of information into a small period of time. Replay each PSA two to three times to make sure students catch everything. You can even pause before each showing and ask students to focus on a particular aspect, such as the messaging, visuals, or call to action.

After viewing each PSA, ask students to critically evaluate each campaign using the **Message Making** worksheet (Student Handout 2). Make sure students consider target audience, messaging, content, and call to action when assigning their grade.

Once everyone has completed the worksheet and assigned the PSA a grade, poll the class to gauge student reaction.

Tip! INSPIRING ACTION Push students to think critically about the PSAs they are evaluating. Have students identify one PSA to journal about in more depth. Make sure they answer the following questions in their reflection writing: *Why is the PSA effective? How does it inspire me to act?*

Repeat the **Message Making** worksheet and grading process for as many PSAs as possible.

6. Spreading the Word!

Using the PSA and advertising techniques students found to be successful during the **Message Making** and **Taking Action** activities, have students work together to create a class campaign to spread the word about invasive species.

Tip! COMMUNITY PARTNERS Collaborate with nearby community organizations, environmental associations, or your nearest USDA office to make your class campaign more powerful. Ask the partners to assist students with research, provide feedback, and help the project reach a larger audience.

As a class, discuss the following questions:

- *Who should our audience be?*
- *How can we get people to care?*
- *What kind of campaign should we create (poster, video, etc.)? Why?*

Have students brainstorm different ideas for campaigns or outreach projects and vote on which one they think will be most effective. (**Note:** *Projects can be done as a class or in small groups.*) Invite students to use the partner tools (such as the Hungry Pests bookmark, bumper sticker, magnet, or flyers) on the Hungry Pests Web site (www.HungryPests.com/partner-tools) to support any outreach efforts, or they can create their own.

Below are some examples of outreach ideas:

- Create a skit.
- Organize a student-led assembly.
- Produce a local hungry pests PSA for the radio or TV.
- Develop a social media campaign.
- Write a musical rap, rhyme, or song. (Check out APHIS' summer camp activity, "Critter Jam," for more information at www.HungryPests.com/partner-tools/HP-YouthActivity.pdf.)
- Install location-specific signage at local fishing, farming, or hiking locations or trails.

Once the projects have been finalized, have students use the **Spreading the Word! Task List** (Student Handout 3) to plan how they will carry out their idea and identify who will do what and by when.



MEXICAN FRUIT FLY

Tip! TEAM LEADERS Pre-assign, or have groups nominate, team leaders to help manage the project. Team leaders can take responsibility for keeping the team on schedule, delegating tasks to team members, and coordinating team communication.

Reflection + Evaluation

7. Presenting: Hungry Pests! A Community Plan

Using all they have learned about invasive species, ask students to prepare a PowerPoint or other visual presentation to share their research and plan of action with relevant audiences, such as parents and school and community members. (**Note:** *This can be done as a class, in small groups, or as part of a summative assessment.*)

Tip! GRADING PROJECT-BASED LEARNING Create a project-based learning rubric for **Spreading the Word!** and **Presenting: Hungry Pests! A Community Plan** to guide students and help you measure specific learning outcomes. Use the following key components of project-based learning to develop appropriate criteria for your own rubric:

- Research
- Teamwork
- Creativity
- Presentation

Have students practice creating effective presentations by requiring the use of both words and imagery to organize the research they've gathered. Students can use the PowerPoint template found in the "Partner Tools" section of the Hungry Pests Web site (www.HungryPests.com/partner-tools) as a starting point for their own presentations.



LIGHT BROWN APPLE MOTH

Tip! PUBLIC SPEAKING 101 Before students share their presentations with an outside audience, ask them to generate a list of things they think effective public speakers do. Use the list below as a prompt.

- Make eye contact with the audience.
- Speak slowly.
- Use body language.
- Create note cards.
- Practice ahead of time.

Refer to this list of student-generated criteria for effective public speaking when grading their presentations.

Extensions

In the News

For schools with daily announcements or video screens, have students arrange to show the Hungry Pests commercials, located on the Partner Tools page of the Hungry Pests Web site at www.HungryPests.com/partner-tools.

Hello My Name is...

To prompt dialogue within the school community about invasive species, have students wear Vin Vasive name tags around school for a day. Just download tags from www.HungryPests.com/partner-tools and print on sticker paper. Students can identify themselves as invasive species ambassadors and answer any questions their peers might have.



Anti-Vin Vasive

Now that students have become familiar with Vin Vasive, the spokesbug for hungry pests everywhere, create an “Anti-Vin” character to act as a more positive environmental ambassador for invasive species-free environments. Have students draw and name their character and submit it to info@HungryPests.com.

Hungry Pests Herald

Contribute articles about invasive species to a class, school, or local newspaper. Ask students to consider the audience they want to target, the format they think will be most effective (letter, essay, speech, poem), and the tone they want to use. Invite students to check out the sample “Feature Article” and “Short Newsletter Story” in the Partner Tools section of the Hungry Pests Web site (www.HungryPests.com/partner-tools) as examples. After the articles are written, have students publish their newsletter by printing and sending copies home to share with family and friends. Copies could also be distributed to local businesses, libraries, or media channels for community members to read.

Real-World Research

Travel outside of the classroom to collect primary source research about individuals and their relationship with invasive species by conducting interviews with local outdoor enthusiasts, hunters, gardeners, bird watchers, growers, ranchers and farmers, loggers and foresters, or park rangers. Students can also visit local APHIS offices to speak with representatives or invite them to visit the class. For contact information, go to www.aphis.usda.gov/planthealth/sphd.

For more research resources, students can check out the links below.

- Bugwood: www.bugwood.org
- USDA Forest Service Web site: www.fs.fed.us
- USDA Forest Service Woodsy Owl campaign: www.fs.usda.gov/main/conservationeducation/smokey-woody

HUNGRY TO LEARN MORE?

The Cooperative Extension Service, operated by USDA and partner universities, is a good resource for field trips, job shadows, or research information.

To find the Cooperative Extension Office nearest you, visit www.nifa.usda.gov/Extension.



IMPORTED FIRE ANT

Hungry Pests Jeopardy

As a final review of the unit, create a classroom version of Jeopardy using invasive species as the topic. Categories could include "Notable Pests," "Name that Pathway," "Famous Quarantines," "Important Impacts," and "Potpourri" (a varied selection of invasive species facts). Have students prepare for the game by reviewing all of the work they've created and revisiting www.HungryPests.com for a refresher.

Plant Health Professionals

Arrange for community members with careers in agriculture or entomology to visit the school and share information with students about where they work, what they do, and any interactions they have with invasive species. Extension educators, master gardeners, State plant regulatory officials (www.nationalplantboard.org/member), and USDA Plant Health Safeguarding Specialists (www.aphis.usda.gov/planthealth/sphd) are great professionals to consider.

DID YOU KNOW?

Your students' crusade against hungry pests doesn't have to end! There are plenty of job opportunities available for students who are interested in protecting our Nation's resources from invasive species.

Possible careers include:

- Biologist
- Botanical illustrator
- Chemist
- Computer modeler
- Entomologist
- Environmental advocate
- Extension educator
- Forester
- GIS mapping specialist
- International trade specialist
- Pest control operator
- Pest identifier
- Pest survey specialist
- Plant health safeguarding specialist
- Plant pathologist
- Secretary of Agriculture
- U.S. Customs and Border Protection agriculture specialist

USDA offers a summer program for middle and high school students interested in learning more about plants, animals, and agribusiness. For details, visit the APHIS Web site at www.aphis.usda.gov/agdiscovery.



FALSE CODLING MOTH

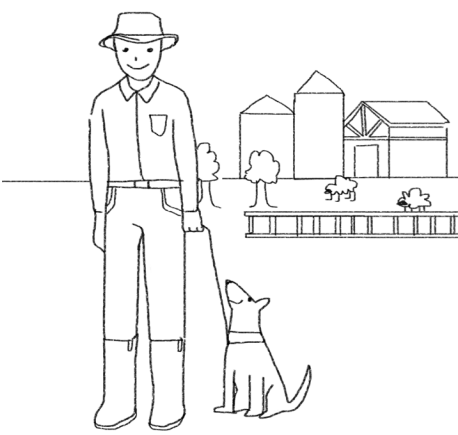
Name: _____

Date: _____

SAMPLE

DIRECTIONS:

Using the prompts below, create a fictitious profile of a person for the category you selected (international travelers, outdoor enthusiasts, hunters, gardeners, bird watchers, growers, ranchers and farmers, loggers and foresters, or commercial producers).

| | |
|---|---|
| <p>Hello! My name is:</p> <p>Frank the Farmer</p> | <p>What I do:</p> <p>I grow fruits, vegetables, and flowers.</p> |
| <p>What I look like:</p>  | <p>Potential encounters with invasive species:</p> <p>Invasive species could hitchhike from place to place on my trucks and hide in my fruits, vegetables, and plants!</p> |
| <p>Things I could do to help stop the introduction and spread of invasive species:</p> <ul style="list-style-type: none"> * Learn to identify the invasive species in my area or nearby. * Report any sightings to my county extension agent or nearest USDA office. * Clean my boots, gear, truck bed, tires, and harvesting equipment after working a site to make sure I am not spreading seeds, insects, or spores to a new location. * Control invasive plants along fencerows, ditches, and other areas adjacent to my fields. * Use weed-free hay and feed for my animals. | |

Name: _____ Date: _____

DIRECTIONS:

Using the graphic organizer below, take notes while you watch each public service announcement (PSA).

**PSA TITLE:****TARGET AUDIENCE:****MESSAGE:****CALL TO ACTION:****REFLECTION QUESTIONS:**

1. What did you learn?
2. What made the PSA memorable?
3. Does the PSA make you want to change your behavior? Why or why not?
4. Is the message important to you?
5. Do you have any unanswered questions?

Name: _____

Date: _____

**DIRECTIONS:**

Using the graphic organizer below, take notes while you watch each public service announcement (PSA).

PSA TITLE:

"I Try To Fit In"

TARGET AUDIENCE:

People who might transport invasive species without realizing it

MESSAGE:

"Hungry pests are invasive insects and other pests that threaten to devour our plant resources. Examples include trees, ornamentals, food crops, as well as threatened and endangered plants."

CALL TO ACTION:

Leave hungry pests behind! Go to hungrypests.com and get the facts.

REFLECTION QUESTIONS:**1. What did you learn?**

Hungry pests eat our plant resources!

2. What made the PSA memorable?

The fact that Vin is such a creepy character.

3. Does the PSA make you want to change your behavior? Why or why not?

I'm definitely going to visit HungryPests.com to learn more.

4. Is the message important to you?

Yes. Trees are really important to our environment.

5. Do you have any unanswered questions?

How do people transport hungry pests?

SPREADING THE WORD! TASK LIST

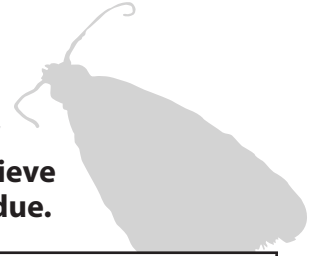
STUDENT HANDOUT 3

LESSON 4

Name: _____ Date: _____

DIRECTIONS:

Use the graphic organizer below to help complete your *Spreading the Word!* campaign. As a group, create a list of tasks you will need to complete to achieve your goal. Decide who will be responsible for each task and when it will be due.



DESCRIPTION OF PROJECT:

| DESCRIPTION OF PROJECT: | | |
|-------------------------|--------------------|----------|
| TASK | PERSON RESPONSIBLE | DUE DATE |
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Learn More

Explore the following resource links with your students for more information on hungry pests and existing initiatives.

- The National Invasive Species Council was established by Executive Order 13112 to ensure that Federal programs and activities to prevent and control invasive species are coordinated, effective, and efficient: **www.invasivespecies.gov**
- Invasive species Executive Order 13112: **www.invasivespeciesinfo.gov/laws/execorder.shtml**
- Center for Invasive Species and Ecosystem Health: **www.invasive.org**
- Find your local Cooperative Extension office to connect with experts who provide useful, practical, and research-based information to agricultural producers, small business owners, youth, consumers, and others in rural areas and communities of all sizes: **www.nifa.usda.gov/Extension**
- USDA Forest Service: **www.fs.fed.us**
- The American Phytopathological Society: **www.apsnet.org**
- The Nature Conservancy's Invasive Species initiative: **www.nature.org/ourinitiatives/habitats/forests/placesweprotect/invasive-species-where-we-work.xml**
- "Don't Pack a Pest" campaign: **www.dontpackapest.com**
- USDA's AgDiscovery summer program for middle and high school students: **www.aphis.usda.gov/agdiscovery**
- Image Gallery by the Plant Diagnostic Information System: **www.pdis.org/ImageLibrary/ImageSearch.aspx**
- Image Gallery by the Plant Management Network: **www.plantmanagementnetwork.org/images**

Educational Resources

- USDA's National Invasive Species Information Center, Educational Resources: **www.invasivespeciesinfo.gov/resources/educk12.shtml**

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